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Fruits and Seeds of *Balgoya pacifica* (*Polygalaceae*) from New Caledonia

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Summary : The anatomical study of flowers, fruits and seeds from 3 collections of *Balgoya pacifica* confirms its inclusion in *Polygalaceae* (tribus *Moutabeeae*).

Résumé : L'analyse anatomique des fleurs, fruits et graines effectuée à partir de 3 échantillons de *Balgoya pacifica*, confirme l'appartenance de ce taxon à la famille des *Polygalaceae* (tribu des *Moutabeeae*).

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In order to confirm the placement of *Balgoya pacifica* (MORAT & MEIJDEN, 1991) in the *Polygalaceae*, the fruits and seeds have been studied and their anatomical features have been compared with those found in other *Polygalaceae* (VERKERKE, 1985).

MATERIAL AND METHODS

MATERIAL STUDIED. — Seeds : *McPherson 1745* and *3394* ; flowers and immature fruits : *McPherson 3374* and *3394*. Flowers, fruits, and seeds from herbarium specimens were soaked in 10 % ammonia, and were subsequentely either embedded in glycol methacrylate and sectioned for LM, or critical point-dried and observed with SEM (see VERKERKE, 1985).

RESULTS. — Fig. 1, 2.

The ovary is 3-locular, with 1 epitropous subapical ovule per locule. The fruit is a subglobose 1-locular berry, up to 11 × 8 × 12 mm, at first green then orange at maturity ; the mesocarp is leathery, 5-7 mm thick, with a subepidermal layer of stone cells.

Sections of young gynoecia show anatropous, crassinucellate, and bitegmig ovules. The nucellus is bulky and the nucellar epidermis forms a nucellar cap. The thin inner integument is two cell layers thick ; the outer integument is 4-6 cells thick. Both the integuments are basally attached to the chalazal region.

The mature seed contains a green, spathulate embryo of which the curved radicle may elongate up to 3000 μm and is 1100 μm in cross section (Fig. 1, *a, b*). The flat cotyledons measure 250 × 3600 μm in cross section. A considerable amount of endosperm surrounds the embryo ; both are rich in fatty substances. The cells of the nucellus are almost completely resorbed by the endosperm ; only its radially elongate epidermal cells with a thick cuticular

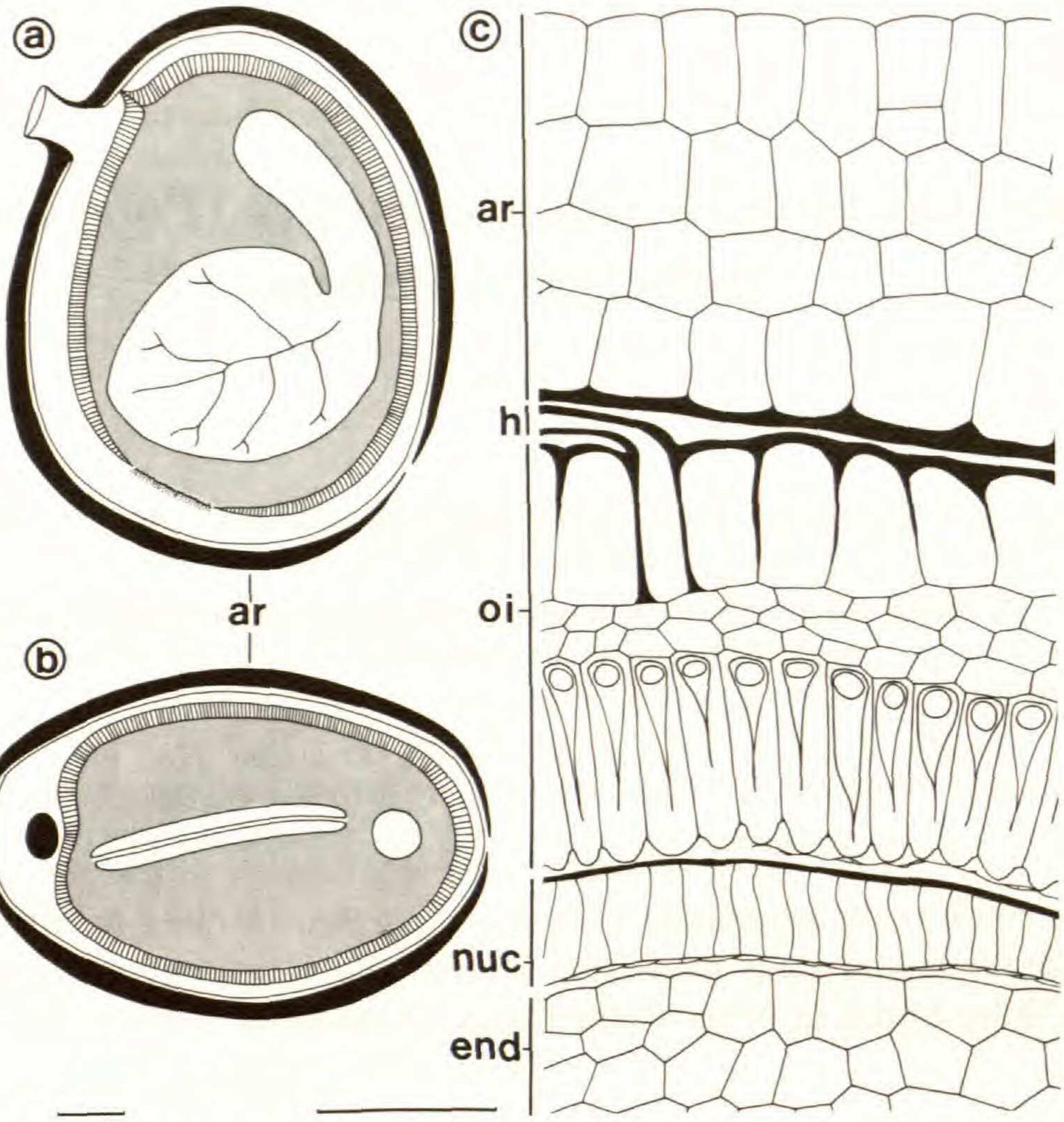

Fig. 1. — **Balgoya pacifica** (LM) : **a**, **b**, seed in longitudinal and cross section, respectively ; **c**, seed coat in cross section ; ar = aril, h = hair, oi = outer integument, nuc = nucellar remains, end = endosperm. Left bar indicates 1 mm for a and b ; right bar indicates 100 μm for c.

layer remain (Fig. 1, *c*). The inner integument is almost completely crushed. With SEM, the crushed cell walls are clearly visible as glued remains against the inner surface of the endotesta (Fig. 2, *b*). In the outer integument, an endotesta is formed by the inner epidermis, the cells of which divide anticlinally and elongate radially, measuring 100-110 × 25-30 μm. These palisade cells have developed prominent radial wall thickenings, but at the proximal side the lumen persists and contains a calcium oxalate crystal. At the distal side, the cell walls are split along the middle lamellae (Fig. 2, *a*). The mesophyll layer is 30-70 μm thick and consists of parenchymatic cells. The thin-walled outer epidermal cells have elongated and measure 80-100 × 40-50 μm ; some have formed unicellular hairs up to 170 μm long (Fig. 2, *c*). Both the hairs and the outer epidermis are covered with a thick cuticle. Totally, the testa is 300-450 μm thick. The raphe contains an amphicribral strand that ends in the chalaza region. The elliptic chalazal region is slightly tanniferous and measures 1000 μm across. The seed is completely surrounded by an unlobed, fleshy, yellowish-white (or orange ?) aril that is attached to the funicular-micropylar region. The outer anticlinal walls of its innermost cell layer are

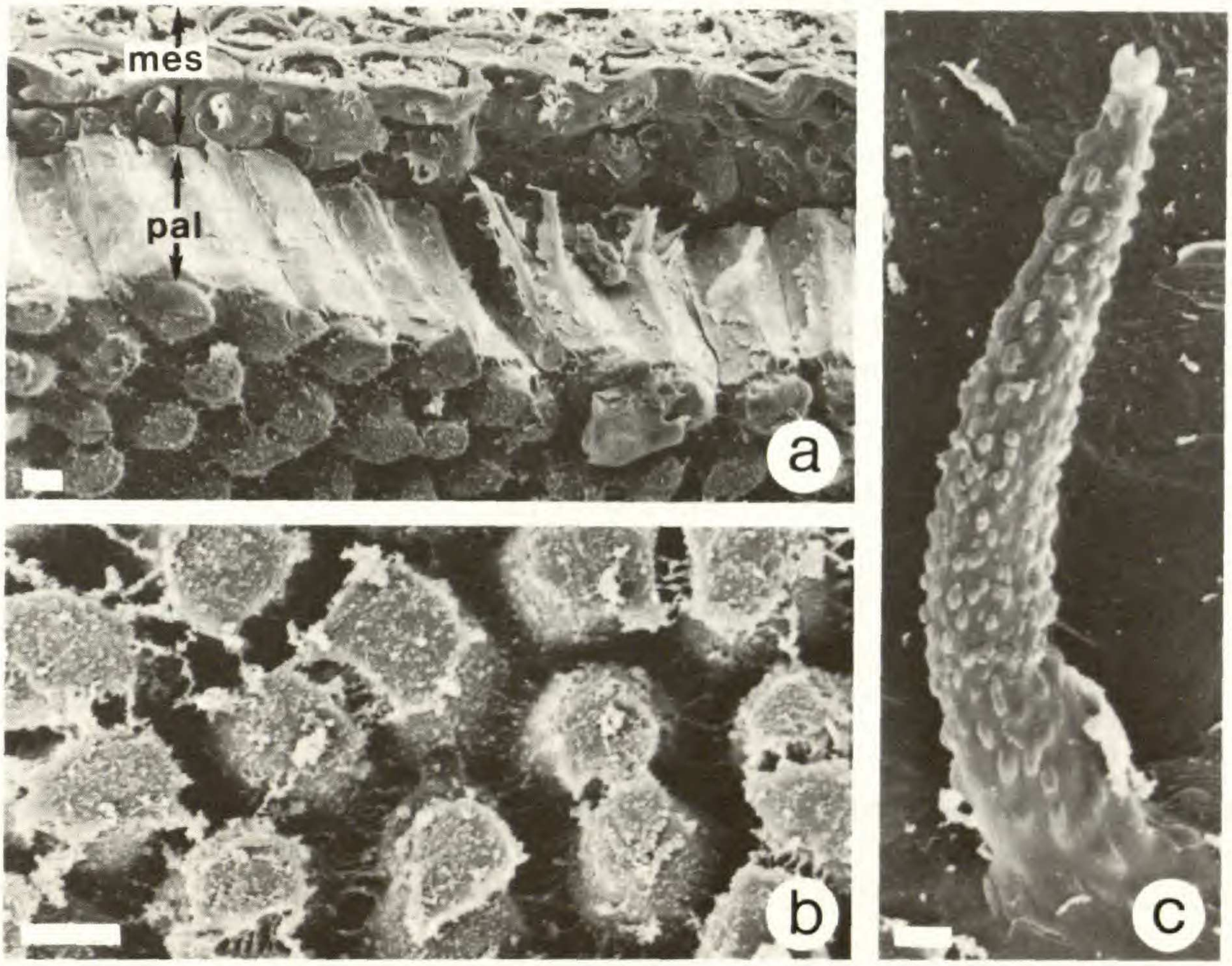

Fig. 2. — **Balgoya pacifica** (SEM) : **a**, cross section of palisade layer ; **b**, inside view of palisade cells with remains of inner integument ; **c**, seed hair ; pal = palisade layer, mes = mesophyll layer. Bar indicates 10 μm.

thickened, but the aril contains no plate collenchymatic wall thickenings. The aril is strongly adherent to the indumentum of the seed. The seed is black, elliptic in cross section and transversely elliptic in longitudinal section, and measures 7 × 5.5 × 9 mm.

DISCUSSION

Within the *Polygalaceae*, a suprageneric group can be recognized that is characterized by comparatively large, indehiscent, 3-7 locular berry-like fruits, and seeds with a more or less weakly developed endotesta, elongated outer epidermal cells that may form a juicy layer, and prominent hairs. Up to now it consisted of 6 small genera, most of them traditionally placed in *Moutabeeae*. Three genera are confined to South America (*Moutabea, Diclidanthera, Barnhartia*), two are African (*Carpolobia, Atroxima*), while *Eriandra* is from New Guinea and the Solomon Islands. In one genus that probably belongs to this group (the South American *Barnhartia*) the fruit is unknown. All genera are probably zoochorous, and *Moutabea* seeds show specialized features related to monkey dispersal. Within the family, a combination of the 2-locular dehiscent fruits with thick-walled seed coats is characteristic of *Polygala* and its satellite genera and represents a derived condition (VERKERKE, 1985).

The ovule, seed, and fruit characters of the specimens presently investigated place it in *Polygalaceae* and exclude all other families of flowering plants. The combination of an endotesta of palisade cells, elongated outer epidermal cells, seed hairs, a persistent nucellar epidermis, inner integument remains on the inner surface of the endotesta, and the green embryo with foliaceous cotelydons, fits in well with the seed and fruit characters of the suprageneric group described above. The differences from the other genera of this group are small. Its seed coat resembles that of *Carpolobia* and *Diclidanthera*, but differs in the more elongated endotesta cells and the presence of an aril. It differs from *Eriandra* in the fewer locules of the fruit, the absence of plate collenchyma in the cells of the aril, and the more strongly elongated and thickened endotestal cells.

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